Revised

A Synopsis

On

IMPACT OF FUTURES TRADING ON INDIAN STOCK MARKET

For

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SUBMITTED BY

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1. Introduction

All markets face various kinds of risk. This has induced the market participants to search for the ways to manage those risks. The derivatives are one of the categories of financial risk management tools. As this consciousness about the risk management capacity of derivatives grew, the markets for derivatives developed (Saksena, 2003). By providing investors and issuers with a wider array of tools for managing risks and raising capital, derivatives improve the sharing of risk in the global economy, lowering the cost of capital formation and stimulating economic growth. The term "derivative" arises from the fact that the agreement "derives" its value from the price of an underlying asset such as a stock, bond, currency, or commodity (Whaley, 2006). Derivatives are financial instruments/contracts whose value depends upon the value of an underlying asset. Since their value is essentially derived out of an underlying, they are financial abstraction whose value is derived mathematically from the changes in the value of the underlying.

The derivatives were launched mainly with the twin objective of risk transfer and to increase liquidity, thereby ensuring better market efficiency. Derivative exchange also contributes to the development of the financial infrastructure of a country by providing the links among cash markets, hedgers and speculators. The derivatives help to assist the business growth by disseminating effective price signals concerning exchange rates, indices and thereby render both cash and derivatives market more efficient.

The financial derivatives gained prominence in post-1970 period due to growing instability in the financial markets and became very popular, accounting for about two-thirds of total transactions in derivative products. In the recent years, the market for financial derivatives has grown both in terms of variety of instruments available, their complexity and turnover. Financial derivatives have changed the world of finance through creation of innovative ways to comprehend measure and manage risks.

India's tryst with equity derivatives began in the year 2000 on the NSE and BSE. Trading first commenced in Index futures contracts, followed by index options in June 2001, options in individual stocks in July 2001 and futures in single stock derivatives in November 2001. Since then, equity derivatives have come a long way. New products; expanding list of eligible investors; rising volumes and best of risk management framework for exchange traded derivatives have been the hallmark of the journey of equity derivatives so far.

India's experience with the launch of equity derivatives market has been extremely positive. The derivatives turnover on the NSE has surpassed the equity market turnover. The turnover of derivatives on the NSE increased from Rs. 23,654 million (US $ 207 million) in 2000-01 to Rs. 110,104,821 million (US $ 2,161 bn) in 2008-09. The average daily turnover in this segment of the markets on the NSE was Rs. 453,106 mn in 2008-09 (NSE factbook, 2010). India is one of the most successful developing countries in terms of a vibrant market for exchange-traded derivatives. This reiterates the strengths of the modern development of India's securities markets, which are based on nationwide market access, anonymous electronic trading, and a predominantly retail market. There is an increasing sense that the equity derivatives market is playing a major role in shaping price discovery.

The numbers of instruments available in derivatives have expanded. To begin with, SEBI only approved trading in index future contracts based on Nifty 50 Index and BSE-30 (Sensex) Index. This was followed by approval for trading in options based on these indices and options on individual securities. NSE proved itself as the market leader contributing 99 % of the total turnover in 2008-09 in India. Not only in Indian scenario, but also in the global market NSE has created a niche for itself in terms of derivatives trading in various instruments.

The fast growth of the derivative market in India has attracted global investment communities, which include mutual funds, individual investors and financial institution. The linkage between these derivatives markets and the stock market is generally established through risk transfer (hedging) and price discovery, two major contributions of the futures markets to economic activity (Rahman, 2001). This has brought forth the question of the impact of introduction of derivative trading on the stock markets in India.

But the Indian stock market doesn't receive much academic attention. Since stock futures trading is having huge share in market capitalization of the derivatives segment, this study investigates the impact of introduction of stock futures trading on the stock markets of India. This study intends to test the impact of futures trading on efficiency and volatility of the stock market.

Efficiency of stock market: Fama (1970) indicates that the Efficient Market Hypothesis (EMH) supposes, that share price adjust rapidly to the appearance of new information, and thus, current prices fully reflect all available information and should follow a random walk process, which means successive stock price changes (returns) are independently and

identically distributed (IID). Based on the information set (Fama, 1970) broken-down the market efficiency into three levels. First, the weak form EMH, which reveals the current stock prices fully reflect all historical market information such as: (prices, trading volumes, and any market oriented information). Second, the semi strong-form EMH, which refers that the prices fully reflect not only the historical information but also all public information together with non-market information such as: (earning and dividend announcements, and economic and political news). Third, the strong-form EMH contends that stock prices reflects all information from historical, public, and private sources, so that no investor can realize abnormal rate of return.

Volatility of the stock market: Volatility represents ups and downs in the stock prices and it is measured by annualized standard deviation. There are two approaches to study the impact of future trading on volatility:

1. Stabilization Approach: This school of thought argues that futures trading increase market depth and enhances efficiency and thereby stabilizes the market. They are proponents of '**Market completion**' or '**Stabilizing forces**' Hypothesis (Debashish, 2007).

2. Destabilization Approach: This school of thought argues that derivatives provide information channel through which information can be easily transmitted to stock market. Frequent arrival and dissemination of information might lead to increased volatility in the stock market and thereby cause increase in volatility and destabilization in the market. They are proponents of **'Destabilizing forces'** (Lockwood and Linn, 1990).

2. Literature Review:

2.1. Efficiency of stock market:

Chigozie (2010) investigated whether Nigerian stock market (from the period 1984 to 2006) follows random walk by using GARCH model. He found that the Nigerian stock market follows random walk and is therefore weak form efficient except in the year 1987, the period of financial deregulation, 1988 when some public companies were privatized, 1995 the period of internationalization of the market and 2000-2006.

Worthington and Higgs (2009) examined the weak form market efficiency of the Australian stock market for both daily returns (6 January 1958 to 12 April 2006) and monthly returns (February 1875 to December 2005) by using serial correlation, run test, unit root test and

multiple variance ratio test. The serial correlation test indicates inefficiency in daily returns and borderline efficiency in monthly returns, while the run tests conclude that both series are weak form inefficient. The unit root test suggests weak form inefficiency in both return series. The variance ratio suggests monthly returns series is characterized by a homoscedastic random walk but the daily series violates weak-form efficiency.

Hasanov (2009) re-examined efficiency of the Australia's and New Zealand's stock markets by applying the non linear unit root test procedure developed by Kapetanios et al. (2003). He concluded that the both stock market are not weak form efficient.

Abedini (2009) studied the weak form efficiency of stock market in the Gulf co-operation council Countries that include Bahrain, Kuwait and Dubai by using the daily price general index for the period between Jan 2005- Nov 2008.By employing Auto-correlation function test and Augmented Dickey- Fuller test he suggests that Efficient market hypothesis can be accepted for all the three markets, whereas Efficient market hypothesis cannot be accepted in Runs test. On the other hand Analysis Variance ratio shows that the Dubai financial market is less efficient and EMH is not supported by the Bahrain and Kuwait stock exchange. Overall he concluded that the stock market in GCC movement is efficient.

Squalli (2006) tested market efficiency hypothesis in Dubai Financial Market (DFM) and Abu Dhabi Securities Market (ADSM). Variance ratio test rejected the random walk hypothesis in all sectors of UAE financial market except in the banking sector of the DFM. Run test found insurance to be the only weak form efficient sector.

Narayan (2005) applied Caner and Hansen's (2001) unit root test to examine the random walk hypothesis for stock prices of Australia and New Zealand and found that the stock prices in both countries are characterized by a unit root, consistent with the efficient market hypothesis.

2.2. Volatility of stock market:

The literature on volatility of stock market is categorized into two approaches: one is stabilization and another is destabilization. Stabilization states that introduction of derivative trading lead to reduction in the volatility while destabilization states reduction of volatility after introduction of derivative trading.

2.2.1 Stabilization Approach

Majority of the studies reported reduction in the cash market volatility after introduction of derivatives trading. Freris (1990) using Hang Seng index in Hong Kong, Baldauf and Santoni (1991) using the S&P 500 index in the USA, Chatrath et al. (1995) for S&P 100 index in the USA, Pericli and Koutmos (1997) using S&P 500 index in USA, Galloway and Miller (1997) using the Mid-cap 400 index, Antoniou et al. (1998) using the S&P 500 index in the USA, Dennis and Sim (1999) for Australia, and Cohen (1999) for the USA, Japan and UK, they all support this proposition. Pilar and Rafael (2002) for Spain and Bologna and Cavallo (2002) for Italy also found decrease in stock market volatility after the introduction of stock index future.

2.2.2. Destabilization Approach

The alternative proposition is that derivative trading increase the volatility in stock market. Lee and Ohk (1992) for Japan , UK and USA , Kamara et al. (1992) for the S&P 500 in USA , Antoniou and Holmes (1995) for the FTSE 100 in UK, Chang et al. (1999) for the Nikkie index in Japan, found support to this proposition. Ryoo and Smith (2004) for the Korean stock market and Pok and Poshakwale (2004) for the Malaysian stock market found an increase in the volatility of the cash market after introduction of stock index future.

2.3. Research Gap

This study is different from previous studies on the following grounds:

1. Most of the studies are conducted outside India.
2. It examines the impact of future trading on efficiency as well as on volatility of stock market which has not been done by researchers.
3. None of the studies has been conducted by considering stock futures of different sectors.

3. Research Objectives:

The objective of the study is to unravel the linkage between derivative trading and behaviour of stock market in the Indian context. Since the stock future trading is the major contributor in the turnover of derivative market, this research work has been carried out to study the impact of stock future trading on stock market of India. Therefore, the main objectives of the study can be summarized as follows:

1. To assess the impact of future trading on efficiency of Indian stock market.
2. To investigate the impact of future trading on stock market volatility.

3. To measure the leverage effect with the help of EGARCH model.
4. To examine the spillover effect between Indian market and US market by including S&P 500.
5. To compare the impact of future trading among different sectors of NSE.

4. Research Methodology:

4.1. Data Collection:

The data set used in this study is the daily closing prices of the stock prices of top 10 companies of major sectors over the different period. However there are several sectors in which future trading is available on limited number of securities. To evaluate the impact of future trading on efficiency and volatility of stock market, whole period is divided into two parts: pre and post introduction of future trading. Table 1 depicts the list of individual securities of different sectors used in the study.

Table 1

List of securities used for study

S.No.	Security	Launch Date	Pre Future Period	Post Future Period	Whole Period
FMCG					
1.	Bajaj Hindustan Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
2.	Balrampur Chini Mills Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
3.	Colgate Palmolive Ltd.	17-12-07	01-04-02 to 16-12-07	17-12-07 to 31-03-11	01-04-02 to 31-03-11
4.	Dabur India Ltd.	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
5.	Hindustan Unilever Ltd.	02-07-01	01-04-96 to	02-07-01 to	01-04-96 to

			01-07-01	31-03-06	31-03-06
6.	ITC Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
7.	United Spirits Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
8.	Tata Tea Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
9.	Asian Paints Ltd.	21-08-08	01-04-03 to 20-08-08	21-08-08 to 31-03-11	01-04-03 to 31-03-11
Infrastructure					
1.	Noida Toll Bridge Co. Ltd.	21-08-08	01-04-03 to 20-08-08	21-08-08 to 31-03-11	01-04-03 to 31-03-11
2.	IVRCL Infrast & Proj Ltd.	27-05-05	01-04-00 to 26-05-05	27-05-05 to 31-03-10	01-04-00 to 31-03-10
3.	Jaiprakash Associates Ltd.	29-12-06	01-04-04 to 28-12-06	29-12-06 to 31-03-11	01-04-04 to 31-03-11
4.	Nagarjuna Constrn. Co. Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
5.	Reliance Infrastructure Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
6.	Unitech Ltd.	14-05-07	01-04-02 to 13-05-07	14-05-07 to 31-03-11	01-04-02 to 31-03-11
Pharmaceutical					
1.	Aurbindo Pharma Ltd.	12-05-05	01-04-00 to 11-05-05	12-05-05 to 31-03-10	01-04-00 to 31-03-10
2.	Biocon Ltd.	06-09-07	01-04-04 to 05-09-07	06-09-07 to 31-03-11	01-04-04 to 31-03-11

3.	Cipla Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
4.	Divi's Laboartories Ltd.	12-05-05	01-04-03 to 11-05-05	12-05-05 to 31-03-10	01-04-03 to 31-03-10
5.	Dr. Reddy's Laboratories	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
6.	Glaxosmithkline Pharma Ltd.	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
7.	Orchid Chem & Pharma Ltd.	12-05-05	01-04-00 to 11-05-05	12-05-05 to 31-03-10	01-04-00 to 31-03-10
8.	Piramal Healthcare Ltd.	15-02-08	01-04-03 to 14-02-08	15-02-08 to 31-03-11	01-04-03 to 31-03-11
9.	Ranbaxy Labs Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
10.	Sterling Biotech Ltd.	14-05-07	01-04-02 to 13-05-07	14-05-07 to 31-03-11	01-04-02 to 31-03-11
Information Technology					
1.	Infosys Technologies Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
2.	Educomp Solutions Ltd.	14-05-07	01-04-06 to 13-05-07	14-05-07 to 31-03-11	01-04-06 to 31-03-11
3.	Tech Mahindra Ltd.	06-09-07	01-04-06 to 05-09-07	06-09-07 to 31-03-11	01-04-06 to 31-03-11
4.	Wipro Ltd.	31-01-03	01-04-98 to 30-01-03	31-01-03 to 31-03-08	01-04-98 to 31-03-08
5.	HCL Technologies Ltd.	31-01-03	01-04-00 to 30-01-03	31-01-03 to 31-03-08	01-04-00 to 31-03-08

6.	GTL Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
7.	Rolta Inida Ltd.	14-05-07	01-04-02 to 13-05-07	14-05-07 to 31-03-11	01-04-02 to 31-03-11
8.	Financial Techno (I) Ltd.	14-05-07	01-04-05 to 13-05-07	14-05-07 to 31-03-11	01-04-05 to 31-03-11
9.	Patni Computers Syst Ltd.	20-04-05	01-04-04 to 19-04-05	20-04-05 to 31-03-10	01-04-04 to 31-03-10
Power					
1.	GVK Pow. & Infra Ltd.	21-08-08	01-04-06 to 20-08-08	21-08-08 to 31-03-11	01-04-06 to 31-03-11
2.	Neyveli Lignite Corporation	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
3.	PTC India Ltd.	21-08-08	01-04-04 to 20-08-08	21-08-08 to 31-03-11	01-04-04 to 31-03-11
4.	Tata Power Co. Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
5.	ABB Ltd.	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
6.	CESC Ltd.	12-05-05	01-04-00 to 11-05-05	12-05-05 to 31-03-10	01-04-00 to 31-03-10
Banking & Finance					
1.	ICICI Bank Ltd.	31-01-03	01-04-98 to 30-01-03	31-01-03 to 31-03-08	01-04-98 to 31-03-08
2.	State Bank of India	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
3.	Axis Bank Ltd.	20-04-05	01-04-00 to	20-04-05 to	01-04-00 to

			19-04-05	31-03-10	31-03-10
4.	HDFC Bank Ltd.	29-08-03	01-04-98 to 28-08-03	29-08-03 to 31-03-08	01-04-98 to 31-03-08
5.	Allahabad Bank	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
6.	Reliance Capital Ltd.	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
7.	IFCI Ltd.	27-05-05	01-04-00 to 26-05-05	27-05-05 to 31-03-10	01-04-00 to 31-03-10
8.	Bank of Baroda	29-08-03	01-04-98 to 29-08-03	29-08-03 to 31-03-08	01-04-98 to 31-03-08
9.	LIC Housing Finance Ltd.	20-4-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
10.	Bank of India	29-08-03	01-04-98 to 28-08-03	29-08-03 to 31-03- 08	01-04-98 to 31-03-08
Media & Entertainment					
1.	Dish TV India Ltd.	21-08-08	01-04-07 to 20-08-08	21-08-08 to 31-03-11	01-04-07 to 31-03-11
2.	Reliance Mediaworks Ltd.	31-07-09	01-04-04 to 30-07-09	31-07-09 to 31-03-11	01-04-04 to 31-03-11
3.	TV18 India Ltd.	21-08-08	01-04-06 to 20-08-08	21-08-08 to 31-03-11	01-04-06 to 31-03-11
4.	ZEE Entertainment ENT Ltd.	12-02-07	01-04-02 to 11-02-07	12-02-07 to 31-03-11	01-04-02 to 31-03-11
5.	Deccan Chronicle Hold Ltd.	21-08-08	01-04-04 to 20-08-08	21-08-08 to 31-03-11	01-04-04 to 31-03-11

Telecommunication					
1.	Bharti Airtel Ltd.	20-04-05	01-04-02 to 19-04-05	20-04-05 to 31-03-10	01-04-02 to 31-03-10
2.	GTL Infra. Ltd.	21-08-08	01-04-07 to 20-08-08	21-08-08 to 31-03-11	01-04-07 to 31-03-11
3.	Mahanagar Telephone Nigam Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
4.	Tata Communications Ltd.	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
5.	Tata Teleserv (Maharashtra)	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
6.	Tulip Telecom Ltd.	06-09-07	01-04-06 to 05-09-07	06-09-07 to 31-03-11	01-04-06 to 31-03-11
Petrochemical					
1.	Aban Offshore Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
2.	Essar Oil Ltd.	12-05-05	01-04-00 to 11-05-05	12-05-05 to 31-03-10	01-04-00 to 31-03-10
3.	Gail(India) Ltd.	26-09-03	01-04-98 to 25-09-03	26-09-03 to 31-03-08	01-04-98 to 31-03-08
4.	Hindustan Petroleum Corp.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
5.	Indian Oil Corp. Ltd.	26-09-03	01-04-98 to 25-09-03	26-09-03 to 31-03-08	01-04-98 to 31-03-08
6.	Reliance Industries Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
7.	Bharat Petroleum Corp. Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06

8.	Oil & Natural Gas Corp.	31-01-03	01-04-98 to 30-01-03	31-01-03 to 31-03-08	01-04-98 to 31-03-08
9.	MRPL	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
Automobiles					
1.	Apollo Tyres Ltd.	19-02-10	01-04-05 to 18-02-10	19-02-10 to 31-03-11	01-04-05 to 31-03-11
2.	Bajaj Auto Ltd.	26-05-08	01-04-03 to 25-05-08	26-05-08 to 31-03-11	01-04-03 to 31-03-11
3.	Bharat Forge Ltd.	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10
4.	Bosch Ltd.	30-11-07	01-04-02 to 29-11-07	30-11-07 to 31-03-11	01-04-02 to 31-03-11
5.	Hero Honda Motors Ltd.	31-01-03	01-04-98 to 30-01-03	31-01-03 to 31-03-08	01-04-98 to 31-03-08
6.	Mahindra & Mahindra Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
7.	Tata Motors Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
Engineering					
1.	BEML Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
2.	BHEL Ltd.	02-07-01	01-04-96 to 01-07-01	02-07-01 to 31-03-06	01-04-96 to 31-03-06
3.	Crompton Greaves Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
4.	Cummins India Ltd.	20-04-05	01-04-00 to 19-04-05	20-04-05 to 31-03-10	01-04-00 to 31-03-10

5.	PRAJ Industries Ltd.	29-12-06	01-04-01 to 28-12-06	29-12-06 to 31-03-11	01-04-01 to 31-03-11
6.	Patel Engineering Ltd.	14-05-07	01-04-05 to 13-05-07	14-05-07 to 31-03-11	01-04-05 to 31-03-11
7.	Larsen & Turbo Ltd.	15-09-06	01-04-04 to 14-09-06	15-09-06 to 31-03-11	01-04-04 to 31-03-11

Source: www.nseindia.com

4.2. Methodology:

Following test are used for the analysis of data:

1. **Descriptive statistic**
2. **Normality test:** Skewness, Kurtosis and Jarque Bera test is used to check the normality of the data.
3. **Unit root test:** Augmented Dickey Fuller (ADF) test, Phillips-Perron (PP) Unit root test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test are used to check the stationarity of the data.
4. **Efficiency of stock market:** Autocorrelation function (ACF), Ljung Box statistic and Run tests are used to see the impact of future trading on efficiency of stock market.
5. **Volatility of stock market:** ARCH LM and EGARCH M tests are used to see the impact of future trading on volatility of stock market.

5. Results and Findings:

This study examined the impact of future trading on weak-form efficiency and volatility of the stock market by using the stock future of major sectors. ADF, PP and KPSS tests are applied to check the stationarity of the data. ADF and PP test reject the null hypothesis of unit root for all the sectors in both pre and post future period which implies that data is stationary. While a result of KPSS shows that the data of some of the companies is not stationary.

The impact of future trading on efficiency of stock market is tested by applying ACF Test, Ljung Box Statistic and Run test and the results are shown in table 2. The ACF test

and Ljung Box Q statistic showed mixed effect on the efficiency of stock of all the sectors. The run test also showed that future trading has mixed effect on efficiency of all the sectors i.e. some stocks has become efficient while other became inefficient after the introduction of future trading. But the stocks of Media & Entertainment are not affected by future trading as they remain weak form efficient in both pre and post future period.

Table 2

Results of efficiency tests

Industries	ACF & Ljung Box Q statistic		Run Test	
	Pre Period	Post Period	Pre Period	Post Period
FMCG	4 Efficient	3 Efficient	8 Efficient	7 Efficient
	5 Inefficient	6 Inefficient	1 Inefficient	2 Inefficient
Infrastructure	3 Efficient	5 Efficient	6 Efficient	5 Efficient
	3 Inefficient	1 Inefficient	0 Inefficient	1 Inefficient
Pharmaceutical	6 Efficient	8 Efficient	6 Efficient	6 Efficient
	4 Inefficient	2 Inefficient	4 Inefficient	3 Inefficient
Information Technology	3 Efficient	4 Efficient	7 Efficient	7 Efficient
	6 Inefficient	5 Inefficient	2 Inefficient	2 Inefficient
Power	6 Efficient	1 Efficient	5 Efficient	3 Efficient
	0 Inefficient	5 Inefficient	1 Inefficient	3 Inefficient
Banking & Finance	4 Efficient	4 Efficient	5 Efficient	6 Efficient
	6 Inefficient	6 Inefficient	5 Inefficient	4 Inefficient
Media & Entertainment	5 Efficient	3 Efficient	5 Efficient	5 Efficient
	0 Inefficient	2 Inefficient	0 Inefficient	0 Inefficient
Telecommunication	6 Efficient	3 Efficient	6 Efficient	5 Efficient
	0 Inefficient	3 Inefficient	0 Inefficient	1 Inefficient
Petrochemical	4 Efficient	4 Efficient	5 Efficient	6 Efficient
	5 Inefficient	5 Inefficient	4 Inefficient	3 Inefficient
Automobiles	3 Efficient	5 Efficient	5 Efficient	5 Efficient
	4Inefficient	2 Inefficient	2 Inefficient	2 Inefficient
Engineering	3 Efficient	2 Efficient	7 Efficient	3 Efficient
	4 Inefficient	5 Inefficient	0 Inefficient	4 Inefficient

The impact of future trading on volatility of Indian stock market is tested by applying EGARCH M model and OLS regression model. In order to apply the EGARCH M test, we need to test the presence of ARCH effect which is tested by applying ARCH LM test. The results showed that hetroskedasticity disappeared for several stocks of all sector except banking and Finance in post future period. The results of mean equation of EGARCH M are shown in table 3. The results of table 3 showed that most of the stocks are not significantly related to their lagged returns and lagged returns of S&P 500. The coefficient of risk premium is significant for Nagarjuna Constrn. Co. Ltd in post future period, Ranbaxy Labs Ltd. in post future period, GTL Ltd. in pre future period, IFCI Ltd. in pre future period, Tata Communications Ltd. in post future period, Essar Oil Ltd. and Reliance Industries Ltd. in pre future period, Tata Motors Ltd. in pre future period which implies that these stocks will compensate their investors for taking higher risk. The result of variance equation shows that volatility of most of the stocks is significantly sensitive to market events in both pre and post future period. There are evidences of mixed effect of asymmetric effect of news on stocks. The persistence of volatility has increased for most of the stocks of FMCG, Power, Banking & Finance, Media & Entertainment, Automobiles and Engineering in post future period. While the persistence of volatility has decreased for most of the companies of Infrastructure, Pharmaceutical, Information Technology, Telecommunication and Petrochemical.

Table 3

Results of EGARCH M

Industries	Lagged return		Lagged return of S&P 500		Risk Premium		ARCH		Leverage Effect		GARCH
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Post
FMCG	2 sig.	2 sig.	0 sig.	1 sig.	0 sig.	0 sig.	4 sig.	7 sig.	1 sig.	1 sig.	Increased for 7 and decreased for 2
Infrastructure	0 sig.	1 sig.	0 sig.	0 sig.	0 sig.	0 sig.	5 sig.	1sig.	1 sig.	1 sig.	Increased for 2 and decreased for 4
Pharmaceutical	2 sig.	0 sig.	0 sig.	0 sig.	0 sig.	1 sig.	7 sig.	2 sig.	0 sig.	0sig.	Increased for 2 and decreased for 8

Information Technology	3 sig.	1 sig.	0 sig.	1 sig.	1 sig.	0 sig.	4 sig.	4 sig.	2 sig.	1sig.	Increased for 2 and decreased for 7
Power	0 sig.	4 sig.	1 sig.	1 sig.	0 sig.	0 sig.	5 sig.	5 sig.	1sig.	2 sig.	Increased for 5 and decreased for 1
Banking & Finance	5 sig.	5 sig.	0 sig.	1 sig.	1 sig.	0 sig.	10sig.	10 sig.	1 sig.	2 sig.	Increased for 6 and decreased for 4
Media & Entertainment	1 sig.	1 sig.	0 sig.	1 sig.	0 sig.	0 sig.	3 sig.	3 sig.	0 sig.	2 sig.	Increased for 7 and decreased for 2
Telecommunication	1 sig.	1 sig.	0 sig.	3 sig.	0 sig.	1 sig.	3 sig.	4 sig.	1sig.	1 sig.	Increased for 2 and decreased for 4
Petrochemical	3 sig.	1 sig.	0 sig.	2 sig.	2 sig.	0 sig.	6 sig.	1 sig.	1sig.	1 sig.	Increased for 4 and decreased for 5
Automobiles	2 sig.	1 sig.	0 sig.	0 sig.	1 sig.	0 sig.	3 sig.	3 sig.	1sig.	1 sig.	Increased for 6 and decreased for 1
Engineering	1 sig.	2 sig.	1 sig.	0 sig.	0 sig.	0 sig.	6 sig.	4 sig.	1sig.	0 sig.	Increased for 6 and decreased for 1

Ordinary least square method is applied in cases where ARCH LM method fails to reject the null hypothesis of ARCH effect. The results of OLS method showed that most of the stocks are not significantly related to their lagged returns and lagged returns of S&P 500. The coefficient of volatility is not significant for all sectors.

The study showed that introduction of future trading has mixed effect on the volatility and efficiency of stock market. The investors will not be able to earn abnormal profit as returns of some stocks became efficient while returns of other stocks have become inefficient. There are structural changes in the volatility of stock market. But there are few companies which

provide higher return to their investors for bearing higher risk. The Regulatory bodies should not make strict rules and regulation for future trading as they don't significantly affect the stock market.

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List of Publications

Journals:

International Journals:

1. Gahlot, Ruchika and Saroj Datta (2011) "Impact of Future Trading on Efficiency and Volatility of Indian Stock Market: A Case of Cnx100". *Journal of Transnational Management,* Vol. 16, No. 1, pp. 43-57 (Routledge).

2. Gahlot, Ruchika and Saroj Datta (2010) "Impact of Derivative Trading on Stock Market Volatility in India: A Study of S&P CNX Nifty". *Eurasian Journal of Business and Economics,* Vol.3, No.6, pp.139-149 (International Ataturk Alatoo University, Bishkek Kyrgyzstan).

National Journal

1. Gahlot, Ruchika and Saroj Datta (2011) "Future Trading and Stock Market Volatility: A study of Bank Nifty" in Drishtikon: A management Journal, Vol. 2, No. 1, pp.237-250 (Publishing India).

2. Gahlot, Ruchika and Saroj Datta (2011) "Foreign Institutional Investors and Indian Derivative Market". Pragyaa: Journal of Management, Vol. 2, No. 1, pp.90-96.

Conferences:

International Conferences:

1. Presented Paper entitled "An Evaluative Study of Impact of Foreign Institutional Investors on Indian Derivative Market" in International conference on Infrastructural Finance, IIT Kharagpur (2010).

2. Presented paper entitled "Regulatory Framework for Derivatives Trading in India: Issues and Challenges" in VII AIB International conference, Delhi (2009).

3. Paper entitled "Impact of Option Trading on Indian Stock Market" accepted for presentation in 4th Annual EuroMed Conference to be held in Elounda, Crete, Greece, 20th - 21st October 2011.

National Conferences:

1. Published paper entitled "Emerging Trends of Foreign Institutional Investors in India" in proceeding of National Seminar on Emerging Marketing Strategies, Hisar (2010).